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AGREEMENT

CONCERNING THE ADOPTION OF UNIFORM CONDITIONS OF APPROVAL AND RECIPROCAL RECOGNITION OF APPROVAL FOR MOTOR VEHICLE EQUIPMENT AND PARTS

done at Geneva on 20 March 1958

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UNIFORM PROVISIONS CONCERNING THE APPROVAL OF REPLACEMENT BRAKE LINING ASSEMBLIES FOR POWER-DRIVEN VEHICLES AND THEIR TRAILERS

UNITED NATIONS

REGULATION No. 90

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF REPLACEMENT BRAKE LINING ASSEMBLIES FOR POWER-DRIVEN VEHICLES AND THEIR TRAILERS

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Regulation No. 90

UNIFORM PROVISIONS CONCERNING THE APPROVAL OF REPLACEMENT BRAKE LINING ASSEMBLIES FOR POWER-DRIVEN VEHICLES AND THEIR TRAILERS

1. SCOPE

1.1. This Regulation applies to replacement service brake lining assemblies intended for use in friction brakes forming part of the braking system of power-driven vehicles and their trailers authorized for use on public roads.

1.2. Replacement brake lining assemblies may be approved for fitment and use on power driven vehicles and trailers having type approval in accordance with Regulation No. 13 and classified in categories $M_1 \leq 3.5$ tonnes and $M_2 \leq 3.5$ tonnes, N_1, O_1 and O_2.

2. DEFINITIONS

For the purposes of this Regulation;

2.1. "Braking system" has the meaning assigned in Regulation No. 13, paragraph 2.3.;

2.2. "Friction brake" means the part of a braking system in which the forces opposing the movement of a vehicle develop by friction between a brake lining and a wheel disc or drum moving relatively to each other;

2.3. "Brake lining assembly" means a component of a friction brake which is pressed against a drum or disc, respectively, to produce the friction force;

2.3.1. "Shoe assembly" means a brake lining assembly of a drum brake;

2.3.1.1. "Shoe" means a component of a shoe assembly which carries the brake lining;

2.3.2. "Pad assembly" means a brake lining assembly of a disc brake;

2.3.2.1. "Backplate" means a component of a pad assembly which carries the brake lining;

2.3.3. "Brake lining" means the friction material component of a brake lining assembly;

2.3.4. "Friction material" means the product of a specified mixture of materials and processes which together determine the characteristics of a brake lining;

2.4. "Brake lining type" means a category of brake linings which do not differ in friction material characteristics;

2.5. "Brake lining assembly type" means a category of brake lining assemblies which do not differ in brake lining type, dimension or functional characteristics;

2.6. "Original brake lining" means a brake lining type referenced in the vehicle type approval documentation, Regulation No. 13, annex 2, paragraph 8;

2.7. "Original brake lining assembly" means a brake lining assembly conforming to the data attached to a vehicle type approval documentation;

2.8. "Replacement brake lining assembly" means a brake lining assembly of a type approved under this Regulation as a suitable service replacement for an original brake lining assembly;

2.9. "Manufacturer" means an organization which can assume technical responsibility for the brake lining assemblies and can demonstrate that it possesses the necessary means to achieve conformity of production.

3. APPLICATION FOR APPROVAL

3.1. An application for approval of a replacement brake lining assembly type for (a) specific vehicle type(s) shall be submitted by the manufacturer of the replacement brake lining assembly or his duly accredited agent.

3.2. An application may be submitted by the holder of (a) vehicle type approval(s) to Regulation No. 13 in respect of replacement brake lining assemblies conforming to the type recorded in the vehicle type approval(s) documentation.

3.3. An application for approval shall be accompanied, in triplicate, by a description of the replacement brake lining assembly with regard to the items specified in annex 1 to this Regulation, and by the following particulars:

3.3.1. diagrams showing functional dimensions of the replacement brake lining assembly;

3.3.2. an indication of the positions of the replacement brake lining assembly on the vehicles for which approval to fit is sought.

3.4. Brake lining assemblies of the type for which approval is sought shall be made available in sufficient quantity to perform the approval tests.

3.5. The applicant shall agree with and make available to the technical service responsible for conducting approval tests the suitable representative vehicle(s).

3.6. The competent authority shall verify the existence of satisfactory arrangements for ensuring effective control of the conformity of production before type approval is granted.

3.6.1. The applicant shall submit values for friction behaviour in accordance with annex 4, paragraph 5.1. of this Regulation.

4. APPROVAL

4.1. If the brake lining assemblies submitted for approval pursuant to this Regulation meet the requirements of paragraph 5 below, approval of the replacement brake lining assembly type shall be granted.

4.2. To each replacement brake lining assembly type approved there shall be assigned an approval number comprising three groups of digits:

4.2.1. The first two digits (at present 00 for the Regulation in its original form) shall indicate the series of amendments incorporating the most recent major technical amendments made to the Regulation at the time of issue of the approval.

4.2.2. The following three digits shall indicate the brake lining type.

4.2.3. A suffix of three digits shall indicate the shoe or backplate.

4.3. The same Contracting Party may not assign the same number to another brake lining assembly type. The same type approval number may cover the use of that brake lining assembly type on a number of differing vehicle types.

4.4. Notice of approval or of extension or refusal of approval or withdrawal of approval or production definitely discontinued of a brake lining assembly type pursuant to this Regulation shall be communicated to the Parties to the 1958 Agreement which apply this Regulation by means of a form conforming to the model in annex 1 to this Regulation.

4.5. There shall be affixed, conspicuously and in a readily accessible place, to every brake lining assembly of a type approved under this Regulation: an international approval mark consisting of:

4.5.1. a circle surrounding the letter "E" followed by the distinguishing number of the country which granted the approval; 1/

4.5.2. the number of this Regulation, followed by the letter "R", a dash and the approval number to the right of the circle prescribed in paragraph 4.5.1.

4.6. The approval mark referred to in paragraph 4.5. above shall be clearly legible and be indelible.

4.7. Annex 2 to this Regulation gives examples of arrangements of the approval mark and approval data referred to above and in paragraph 6.5.

5. SPECIFICATIONS AND TESTS

5.1. GENERAL

A replacement brake lining assembly shall be so designed and constructed that when substituted for the assembly originally fitted to a vehicle the braking efficiency of that vehicle accords with that of the approved vehicle type in compliance with the prescriptions of Regulation No. 13, annex 4.

Specifically:

(a) a vehicle equipped with replacement brake lining assemblies shall satisfy the relevant braking prescriptions of Regulation No. 13;

(b) a replacement brake lining assembly shall display dynamic friction characteristics similar to that of the original brake lining assembly it is intended to replace;

(c) a replacement brake lining assembly must possess adequate mechanical characteristics.

1/ 1 for Germany, 2 for France, 3 for Italy, 4 for the Netherlands, 5 for Sweden, 6 for Belgium, 7 for Hungary, 8 for the Czech and Slovak Federal Republic, 9 for Spain, 10 for Yugoslavia, 11 for the United Kingdom, 12 for Austria, 13 for Luxembourg, 14 for Switzerland, 15 (vacant), 16 for Norway, 17 for Finland, 18 for Denmark, 19 for Romania, 20 for Poland, 21 for Portugal, 22 for the Russian Federation and 23 for Greece. Subsequent numbers shall be assigned to other countries in the chronological order in which they ratify or accede to the Agreement concerning the Adoption of Uniform Conditions of Approval and Reciprocal Recognition of Aproval for Motor Vehicle Equipment and Parts, and the numbers thus assigned shall be communicated by the Secretary-General of the United Nations to the Contracting Parties to the Agreement.

5.2. Replacement brake lining assemblies conforming to the type specified in vehicle type approval documentation to Regulation No. 13, are deemed to satisfy the requirements of paragraph 5 of this Regulation.

5.3. VEHICLE TEST/CONFORMANCE WITH REGULATION NO. 13

A vehicle which is representative of the type for which the replacement brake lining assembly approval is required shall be equipped with replacement brake lining assemblies of the type for which approval is sought and instrumented for brake testing as required by Regulation No. 13.

5.3.1. The braking system of the vehicle shall be tested according to the relevant prescriptions in Regulation No. 13 2/, annex 4, paragraph 1.

5.3.2. The vehicle must satisfy all the relevant requirements stated in Regulation No. 13 2/, annex 4, paragraphs 2 and 3 for that category of vehicle.

5.4. SPEED SENSITIVITY

Speed sensitivity shall be measured by performing one of the two tests described in annex 3, paragraphs 1.2. and 2.2. and plotting the results in accordance with paragraphs 1.2.2. or 2.2.2. Decelerations recorded for the higher speeds shall lie within 15 per cent of that recorded for the lowest speed.

5.5. DYNAMIC FRICTION COMPARISON

A comparison of dynamic friction characteristics of a replacement brake lining assembly and an original brake lining assembly shall be made by comparing the results of testing to one of two methods:

5.5.1. vehicle testing as specified in annex 3, paragraph 1;

5.5.2. inertia dynamometer testing as specified in annex 3, paragraph 2.

5.5.3. The replacement brake lining assembly shall be considered to show similar dynamic friction characteristics to the original brake lining assembly if the achieved rates of deceleration at the specified control force or line pressures are within 15 per cent of those obtained with original brake lining assemblies for cold performance.

2/ As amended by the 06 series of amendments to Regulation No. 13.

5.6. MECHANICAL CHARACTERISTICS

5.6.1. Replacement brake lining assemblies of the type for which approval is requested shall be tested for shear strength according to ISO 6312 (1981) Standard.

5.6.1.1. The minimum acceptable shear strength is 250 N/cm^2 for pad assemblies and 100 N/cm^2 for shoe assemblies.

5.6.2. Replacement brake lining assemblies of the type for which approval is requested shall be tested for compressibility according to ISO 6310 Standard.

5.6.2.1. The compressibility value should not exceed 2 per cent at ambient temperature and 5 per cent at 400° C for pad assemblies and 2 per cent at ambient temperature and 4 per cent at 200° C for shoe assemblies.

6. PACKAGING AND MARKING

6.1. Replacement brake lining assemblies conforming to a type approved in accordance with this Regulation shall be marketed in axle sets.

6.2. Each axle set shall be contained in a sealed package constructed to show previous opening.

6.3. Each package shall display the following information:

6.3.1. the quantity of replacement brake lining assemblies in the package;

6.3.2. manufacturer's name or trade mark;

6.3.3. make and type of replacement brake lining assemblies;

6.3.4. the vehicles/axles/brakes for which the contents are approved;

6.3.5. the approval mark.

6.4. Each package shall contain fitting instructions with particular reference to ancillary parts.

6.5. Each replacement brake lining assembly shall display one set of approval data:

6.5.1. the approval mark;

6.5.2. the date of manufacture, at least month and year;

6.5.3. make and type of brake lining.

7. MODIFICATIONS AND EXTENSION OF APPROVAL OF THE REPLACEMENT BRAKE LINING ASSEMBLY

7.1. Every modification of the replacement brake lining assembly type shall be notified to the administrative department which granted the type approval. The department may then either:

7.1.1. consider that the modifications made are unlikely to have appreciable adverse effects and that in any event the brake lining assembly still complies with the requirements; or

7.1.2. require a further test report from the technical service responsible for conducting the tests.

7.2. Confirmation or refusal of approval, specifying the alterations, shall be notified by the procedure specified in paragraph 4.4. above to the Parties to the 1958 Agreement applying this Regulation.

7.3. The competent authority issuing the extension of approval shall assign a series number for such an extension and inform thereof the other Parties to the 1958 Agreement applying this Regulation by means of a communication form conforming to the model in annex 1 to this Regulation.

8. CONFORMITY OF PRODUCTION

8.1. Replacement brake lining assemblies approved to this Regulation shall be so manufactured as to conform to the type approved.

8.2. Original brake lining assemblies being the subject of an application under paragraph 3.2. are deemed to satisfy the requirements of paragraph 8.

8.3. To verify that the requirements of paragraph 8.1. are met, suitable controls of the production shall be applied. These shall encompass the control of raw materials and components used.

8.4. The holder of an approval shall in particular:

8.4.1. ensure that for each replacement brake lining assembly type, at least the tests prescribed in section 5.6. plus a friction behaviour test as prescribed in annex 4 of this Regulation - or an equivalent test using a full size brake and being approved by the competent authority - are carried out on a statistically controlled and random basis in accordance with a regular quality assurance procedure;

8.4.2. ensure existence of procedures for the effective control of the quality of products;

8.4.3. have access to the control equipment necessary for checking the conformity of each approved type;

8.4.4. analyse the results of each type of test in order to verify and ensure the consistency of the product characteristics, making allowance for variation of an industrial production;

8.4.5. ensure that data of test results are recorded and that annexed documents remain available for a period to be determined in agreement with the administrative service;

8.4.6. ensure that any samples or test pieces giving evidence of non-conformity with the type of test considered shall give rise to another sampling and another test. All the necessary steps shall be taken to re-establish the conformity of the corresponding production.

8.5. The competent authority which has granted type-approval may at any time verify the conformity control methods applicable to each production unit.

8.5.1. In every inspection, the test books and production survey records shall be presented to the visiting inspector.

8.5.2. The inspector may take samples at random to be tested in the manufacturer's laboratory. The minimum number of samples may be determined according to the results of the manufacturer's own verification.

8.5.3. When the quality level appears unsatisfactory or when it seems necessary to verify the validity of the tests carried out in application of paragraph 8.5.2. the inspector shall select samples to be sent to the technical service which has conducted the type approval tests.

8.5.4. The competent authority may carry out any tests prescribed in this Regulation.

8.5.5. The normal frequency of inspections authorized by the competent authority shall be one per year. In the case where negative results are recorded during one of these visits, the competent authority shall ensure that all necessary steps are taken to re-establish the conformity of production as rapidly as possible.

9. PENALTIES FOR NON-CONFORMITY OF PRODUCTION

9.1. The approval granted in respect of a replacement brake lining assembly type pursuant to this Regulation may be withdrawn if the requirements laid down in paragraph 8.1. above are not complied with,

9.2. If a Contracting Party to the Agreement applying this Regulation withdraws an approval it has previously granted, it shall forthwith so notify the other Contracting Parties applying this Regulation, by means of a communication form conforming to the model in annex 1 to this Regulation.

10. PRODUCTION DEFINITELY DISCONTINUED

If the holder of the approval completely ceases to manufacture a replacement brake lining assembly type approved in accordance with this Regulation, he shall so inform the authority which granted the approval. Upon receiving the relevant communication that authority shall inform thereof the other Parties to the Agreement applying this Regulation by means of a communication form conforming to the model in annex 1 to this Regulation.

11. NAMES AND ADDRESSES OF TECHNICAL SERVICES RESPONSIBLE FOR CONDUCTING APPROVAL TESTS, AND OF ADMINISTRATIVE DEPARTMENTS

The Parties to the 1958 Agreement which apply this Regulation shall communicate to the United Nations secretariat the names and addresses of the technical services responsible for conducting approval tests and of the administrative departments which grant approval and to which forms certifying approval or extension or refusal or withdrawal of approval, or production definitely discontinued, issued in other countries, are to be sent.

Annex 1

(Maximum format: A4 (210 x 297 mm))

COMMUNICATION

issued by: Name of administration

.....

.....

.....

concerning 2/ APPROVAL GRANTED
APPROVAL EXTENDED
APPROVAL REFUSED
APPROVAL WITHDRAWN
PRODUCTION DEFINITELY DISCONTINUED

of a replacement brake lining assembly pursuant to Regulation No. 90

Approval No. ... Extension No. ....

1. Applicant's name and address .....

2. Manufacturer's name and address .....

3. Make and type of brake lining assembly .....

4. Make and type of brake lining .....

5. Vehicles/axles/brakes for which the brake lining assembly type qualifies as original brake lining assembly .....

6. Vehicles/axles/brakes for which the brake lining assembly type qualifies as replacement brake lining assembly .....

7. Submitted for approval on .....

8. Technical Service responsible for approval tests .....

8.1 Date of test report .....

8.2 Number of test report .....

9. Approval granted/extended/refused/withdrawn 2/ .....

10. Place .....

11. Date .....

12. Signature .....

13. Annexed to this communication is a list of documents in the approval file deposited at the administrative services having delivered the approval and which can be obtained upon request.

Notes

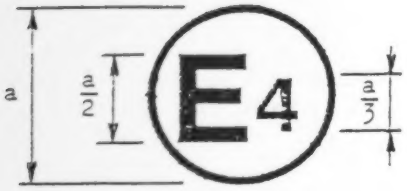
1/ Distinguishing number of the country which has granted/extended/refused/withdrawn approval (see approval provisions in the Regulation).

2/ Strike out what does not apply.

Annex 2

ARRANGEMENTS OF THE APPROVAL MARK AND APPROVAL DATA

(See paragraph 4.7. of this Regulation)

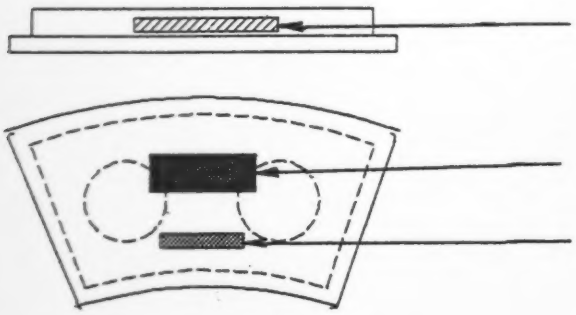


90 R - 00047/901

"a" = 8 mm minimum

The above approval mark shows that the item concerned has been approved in the Netherlands (E4) pursuant to Regulation No. 90. In this illustration the first two digits of the approval number refer to the issue number of the Regulation; the following three digits are those allocated by the approval authority to the brake lining type, and the suffix digits are those allocated by the approval authority to the shoe or backplate. All eight digits together comprise the approval number for that replacement brake lining assembly type.

Example of pad assembly marking

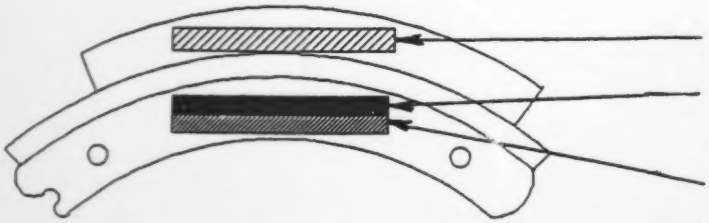


Make and type of brake lining

Date of assembly manufacture and manufacturer's name or trade mark

Approval mark

Example of shoe assembly marking



Make and type of brake lining

Date of assembly manufacture and manufacturer's name or trade mark

Approval mark

Note: Positions of markings and mutual positions of markings shown in the examples are not mandatory.

Annex 3

ASSESSMENT OF DYNAMIC FRICTION CHARACTERISTICS

1. Vehicle test/split axle test

For this test the vehicle shall be fully laden and all brake applications made with engine disconnected, on a level road.

The vehicle service brake control system shall be equipped with a means of isolating front and rear axle brakes so that either may be used independently of the other.

Where replacement brake lining assembly approval is required for front axle brakes the rear axle brakes shall remain inoperative throughout the test.

Where replacement brake lining assembly approval is required for rear axle brakes the front axle brakes shall remain inoperative throughout the test.

Brake lining assemblies submitted for test shall be fitted to the relevant brakes and burnished to the manufacturer's instructions.

1.1. Cold Performance

1.1.1. Make a minimum of six consecutive brake applications at spaced increments of pedal effort or line pressure up to wheel lock or, alternatively, up to 6 m/s^2 deceleration, from an initial speed calculated to generate a proportion of fully laden vehicle kinetic energy at 80 km/h corresponding to vehicle axle braking ratio, and with brake temperature $\leq$ 100° C at the start of each application.

1.1.2. Note and plot pedal force and mean fully developed deceleration for each application, and determine the pedal force required to achieve decelerations of 5 m/s^2 for front axle brakes and 3 m/s^2 for rear axle brakes.

1.2. Speed Sensitivity

1.2.1. Using the pedal force derived from 1.1.2. and with initial brake temperature $\leq$ 100° C, make three consecutive brake applications from each of the following speeds:

For front axle 65, 100 km/h and 135 km/h where Vmax exceeds 150 km/h.

For rear axle 45, 65 km/h and 90 km/h where Vmax exceeds 150 km/h.

1.2.2. Average the results for each group of three applications and plot line pressures with corresponding decelerations.

2. Inertia Dynamometer Test

For this test an inertia dynamometer and equipment are arranged to simulate a single vehicle brake.

The dynamometer shaft rotational speed shall correspond to the wheel rotational speed at vehicle initial speed as calculated in paragraph 1.1. of this annex.

The dynamometer inertia shall be capable of generating half the relevant axle portion of total fully laden vehicle kinetic energy at 80 km/h.

Brake lining assemblies submitted for test shall be fitted to the brake and burnished to the manufacturer's instructions.

2.1. Cold Performance

2.1.1. From the initial speed in paragraph 2 above and with brake temperature $\leq$ 100° C at the start of each application make a minimum of six consecutive brake applications at spaced internals of line pressure up to an achieved deceleration rate of 6 m/s^2.

2.1.2. Note and plot line pressure and mean fully developed deceleration for each application, and determine line pressure required to achieve 5 m/s^2 for a front axle brake and 3 m/s^2 for a rear axle brake.

2.2. Speed Sensitivity

2.2.1. Using the line pressure derived from 2.1.2. and with initial brake temperature $\leq$ 100° C make three consecutive brake applications from rotational speeds corresponding to vehicle linear speeds of:

for front axle brake 65, 100 km/h and 135 km/h where Vmax exceeds 150 km/h;

for rear axle brake 45, 65 km/h and 90 km/h where Vmax exceeds 150 km/h.

2.2.2. Average the results for each group of three applications and plot line pressures with corresponding decelerations.

Annex 4

DETERMINATION OF FRICTION BEHAVIOUR OF BRAKE LININGS BY MACHINE TESTING

1. INTRODUCTION

1.1. Samples of a replacement brake lining assembly type shall be tested on a machine capable of generating the test conditions and applying the test procedures described in this annex.

1.2. Test results shall be evaluated to determine sample friction behaviour.

1.3. The friction behaviour of samples shall be compared to assess conformity with the standard registered for a replacement brake lining assembly type.

2. EQUIPMENT

2.1. The machine shall be designed to accept and operate a full scale brake similar to those fitted to the vehicle axle used for approval testing to paragraph 5 of this Regulation.

2.2. The disc or drum rotational speed shall be 660 $\pm$ 10 1/min without load and shall not fall below 600 1/min on full load.

2.3. The mean contact pressure at the brake lining working surface shall be constant at 100 $\pm$ 20 N/cm^2 for pad assemblies and 22 $\pm$ 6 N/cm^2 for shoe assemblies, calculated for a static brake without self-energizing.

2.4. The test cycles and brake applications during the cycles to be adjustable and automatic.

2.5. Output torque and working surface temperature shall be recorded.

2.6. Provision shall be made to direct cooling air across the brake at a rate of 600 $\pm$ 60 m^3/hr.

3. TEST PROCEDURE

3.1. Sample Preparation

The manufacturer's bedding schedule shall ensure a minimum of 80 per cent surface contact area for pad assemblies without exceeding a surface temperature of 300° C and 70 per cent surface contact area for leading shoe assemblies without exceeding a surface temperature of 200° C.

3.2. Test Schedule

The test schedule comprises a number of consecutive braking cycles each containing 10 braking intervals of 5 seconds brake applied followed by 10 seconds brake released.

3.2.1. For pad assemblies six cycles without forced cooling one cycle with forced cooling.
Initial temperature for first application of first cycle 60°C max.
Initial temperature for first application of all subsequent cycles 100° C.

3.2.2. For shoe assemblies one cycle with forced cooling limiting temperature to 200° C.
One cycle without forced cooling
One cycle with forced cooling limiting temperature to 200° C
One cycle without forced cooling
Initial temperature for first application of first cycle 60° C max.
Initial temperature for first application of subsequent cycles 100° C.

4. EVALUATION OF TEST RESULTS

Friction behaviour is determined from the brake torque noted at selected points in a test schedule. Where brake factor is constant, e.g. a disc brake, brake torque may be translated to coefficient of friction.

4.1. Pad Assemblies

4.1.1. The operational coefficient of friction (μ_{op}) is the mean of the values recorded during cycles two to seven; measurement being made one second after commencing the first brake application of each cycle.

4.1.2. The maximum coefficient of friction (μ_{max}) is the highest value recorded during cycles one to seven inclusive.

4.1.3. The minimum coefficient of friction (μ_{min}) is the lowest value recorded during cycles one to seven inclusive.

4.2. Shoe Assemblies

4.2.1. The mean torque (M_{mean}) is the average of the maximum and minimum values of brake torque recorded during the fifth brake application of cycles one and three.

4.2.2. The hot torque (M_{hot}) is the minimum brake torque developed during cycles two and four. If the temperature exceeds 300° C during these cycles the value at 300° C is to be taken as M_{hot}.

5. ACCEPTANCE CRITERIA

5.1. With each application for approval of a replacement brake lining assembly type there shall be submitted:

5.1.1. for pad assemblies, values for μ_{op}, μ_{min}, μ_{max}.

5.1.2. for shoe assemblies, values for M_{mean} and M_{hot}.

5.2. During production of an approved replacement brake lining assembly type, test samples must demonstrate compliance with the values registered under paragraph 5.1. of this annex within the following tolerances:

5.2.1. for disc brake pads μ_{op} $\pm$ 15 per cent of registered value
$\mu_{min} \geq$ registered value
$\mu_{max} \leq$ registered value

5.2.2. for simplex drum brake linings M_{mean} $\pm$ 20 per cent of registered value
$M_{hot} \geq$ registered value.